WORKPLACE SOLUTIONS

From the National Institute for Occupational Safety and Health

Reducing Exposure to Lead and Noise at Indoor Firing Ranges

Summary

Workers and users of indoor firing ranges may be exposed to hazardous levels of lead and noise. The National Institute for Occupational Safety and Health (NIOSH) recommends steps for workers and employers to reduce exposures.

Description of Exposure

According to the Bureau of Justice Statistics, more than 1 million Federal, State, and local law enforcement officers work in the United States [DOJ 2004]. They are required to train regularly in the use of firearms. Indoor firing ranges are often used because of their controlled conditions (see Figure 1). In addition to workers, more than 20 million active target shooters practice at indoor firing ranges. Law enforcement officers may be exposed to high levels of lead and noise at indoor firing ranges. NIOSH estimates that 16,000 to 18,000 firing ranges operate in the United States.

Several studies of firing ranges have shown that exposure to lead and noise can cause health problems associated with lead exposure and hearing loss, particularly among employees and instructors. Lead exposure occurs mainly through inhalation of lead fumes or ingestion (e.g., eating or drinking with contaminated hands) (see Figure 2) [NIOSH 2009].

Exposure Limits

Lead

OSHA has established limits for airborne exposure to lead (see 29 CFR 1910.1025*). The standard creates the action level and the permissible exposure limit (PEL). The action level for airborne lead exposure is 30 micrograms per cubic meter of air ($\mu g/m^3$) as an 8-hour time weighted average (TWA). The OSHA PEL for airborne exposure to lead is 50 $\mu g/m^3$ as an 8-hour TWA, which is reduced for shifts longer than 8 hours.

The NIOSH recommended exposure limit (REL) for airborne lead is 50 $\mu g/m^3$ as an 8-hour TWA. A worker's blood lead level (BLL) should remain below 60 μg lead/100g of whole blood [NIOSH 2009].

*Code of Federal Regulations. See CFR in References.

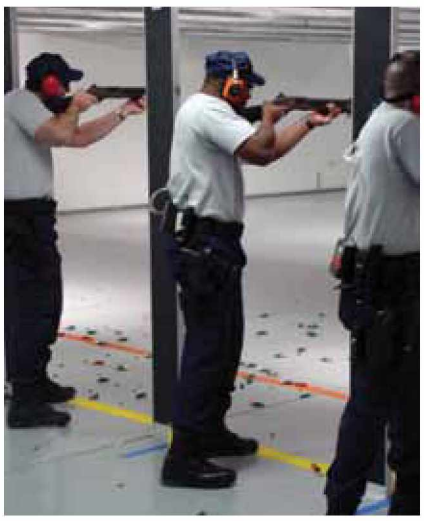

Figure 1. Law enforcement officers during shooting practice.

Noise

For noise exposure, the OSHA limit is a maximum PEL of 90 decibels, A-weighted (dBA), averaged over an 8-hour time period (see 29 CFR 1910.95).

The NIOSH REL for noise (8-hour TWA) is 85 dBA using a 3-dB exchange rate [see NIOSH 1998]. Exposure to impulse noise, such as that

Figure 2. Emissions from the discharge of firearms.

which comes from weapons, cannot exceed 140 dB sound pressure level (SPL).

Case Studies

Case 1—Lead exposure of school rifle teams

The Alaska Environmental Public Health Program initiated a statewide review of school-sponsored rifle teams after a team coach was found to have an elevated BLL of 44 μg/dL. The review examined six rifle teams using three indoor firing ranges. Teams using two of the firing ranges did not show elevated BLLs. The other three teams used a firing range with extensive lead contamination. The teams showed elevated BLLs.The highest level was 31 μg/dL, which is above the level considered elevated (25 μg/dL). The firing range was voluntarily closed and arrangements were made for a thorough evaluation [State of Alaska 2003; NIOSH 2009].

Case 2—Noise exposures of Federal and local law enforcement officers

NIOSH investigators conducted live-fire noise exposure evaluations of Federal and local law enforcement officers at indoor and outdoor firing ranges. Measurements were conducted on a variety of law enforcement firearms. Peak sound pressure levels ranged from 155–168 dB SPL. A-weighted, equivalent (averaged) levels ranged from 124–128 dBA. Hearing protectors were also evaluated. Earmuffs had a mean peak reduction of 26 dB; earplugs alone had a mean peak reduction of 24 dB. The mean peak reduction for combined earmuffs and earplugs was 44 dB. NIOSH recommended the use of this double protection for impulsive noise and also noise abatement strategies, modifications to the firing range structure, and a hearing conservation program [NIOSH 2009].

Recommendations

Workers and shooters at firing ranges should take the following steps to protect themselves:

- Take training, follow safe work practices, and participate in health monitoring programs.
- Use personal protective equipment (PPE):
  - Use double hearing protection (earplugs and earmuffs).
  - Wear respirators and full protective outer clothing for maintenance activities that involve close contact with lead dust or spent bullets.

- Wear gloves and eye protection when using chemicals to clean weapons or firing range surfaces.

- Practice good hygiene:
  - Wash hands, arms, and face before eating, drinking, smoking, or contact with others.
  - Change clothes and shoes before leaving the facility.
  - Wash clothes used at the firing range separately from family's clothes.

- Report symptoms to your employer and get medical attention when needed:
  - Common health effects of lead poisoning in adults include reproductive effects, nausea, diarrhea, vomiting, poor appetite, weight loss, anemia, fatigue or hyperactivity, headaches, stomach pain, and kidney problems.
  - If you suspect you have been exposed to lead, even if you have no symptoms, get your blood lead level tested.
  - Exposure to high noise levels can cause hearing loss, tinnitus (ringing in the ear), stress, high blood pressure, fatigue, and gastro-intestinal problems.

Employers should take the following steps to protect workers and shooters at firing ranges:

- Provide workers and shooters with training and information about hazards:
  - Inform pregnant workers and shooters about possible risks to the fetus.
  - Ensure that workers are aware of symptoms that may indicate a health problem.
  - Tell workers about participating in medical surveillance programs and getting blood lead levels tested, even if they don't show symptoms.

- Establish effective engineering and administrative controls:
  - Install an effective supply air and exhaust ventilation system.
  - Maintain and replace air filters regularly.
  - Apply appropriate noise control measures to limit noise inside the range and in nearby areas.
  - Keep the firing range and other workplace areas clean using proper cleaning procedures such as wet sweeping and HEPA vacuuming of surfaces.
  - Provide workers with lockers and places to wash to avoid take-home contamination.
  - Limit length of time that workers and shooters use the firing range: rotate assignments and provide quiet, clean, break areas.

- Provide workers with protective equipment:
  - Provide hearing protection devices such as earplugs and earmuffs.
  - Provide skin protection, eye protection, and NIOSH-approved respirators for workers who clean lead-contaminated areas.
  - Provide floor mats, knee pads, and shoe covers to limit transfer of lead to clothing.

- Review OSHA requirements for medical monitoring for lead (29 CFR 1910.1025(j)) and noise (29 CFR 1910.95(d)(e)(g)(h)).

- For best medical and lead management practices, consult the Association of Occupational and Environmental Clinics, Kosnett et al. [2007] and NASR [2005].

Acknowledgments

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For More Information

More information about firing ranges and noise and lead exposure can be found on the following NIOSH Web sites:

http://www.cdc.gov/niosh/topics/ranges/
http://www.cdc.gov/niosh/topics/noise/
http://www.cdc.gov/niosh/topics/lead/

To obtain information about other occupational safety and health topics, contact NIOSH at

Telephone: 1–800–CDC–INFO (1–800–232–4636)
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or visit the NIOSH Web site at www.cdc.gov/niosh

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